Amendments to the Claims

PLEASE AMEND THE CLAIMS AS FOLLOWS:

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1. (CURRENTLY AMENDED) A method of fabricating a semiconductor color imager having ~~a~~ an optical structure wherein an overcoat layer is adapted for optimizing long focal length microlens performance in an ordered process sequence comprising:

a semiconductor substrate having a matrix of imaging sensors formed thereon, each imaging sensor having a photosensitive area and a complementary non-photosensitive area, said matrix of imaging sensors being organized in a plurality of subsets;

forming a first matrix of light shields over the non-photosensitive areas of the matrix of imaging sensors;

forming a first passivation layer over the matrix of imaging sensors;

forming a first optically transparent planarization layer over the first passivation layer over ~~the matrix of imaging sensors~~;

forming a first patterned color filter layer on the first optically transparent planarization layer, said patterned color filter layer being registered with the photosensitive areas of first a first subset of th matrix of imaging sensors;

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~~forming a second planarizing layer on the first patterned color filter layer;~~

forming upon the first patterned color filt r lay r a second planarizing and/or patterend color filter layer in mutual registration with the first color filter layer and a with subset of photosensitive areas (color pixels);

~~forming a third planarizing layer on the second planarizing layer;~~

forming upon the second planarizing and/or color filter layer, a third planarizing and/or color filter layer in mutual registration with the first and second color filter layers and a subset of photosensitive areas (color pixels;

patterning a layer of microlens material to form a first matrix of microlenses over the third planarizing and/or color filter layer, said first matrix of microlenses being mutually registered with the photosensitive areas in the matrix of imaging sensors;

forming an overcoat layer over the first matrix of microlenses, said overcoat layer having high transmittance, said overcoat layer providing patterned or uniform optical compensation between the subsets of the matrix of the imaging sensors;

~~whereby the performance of the color imager is optimized.~~

whereby said optical structure provides flexibility in design and optimized performance in a single color or a multiple color semiconductor imager.

2. (ORIGINAL) The method of Claim 1, wherein:

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the semiconductor substrate material may be selected from the group consisting of periodic tabl IV, III-V, II-VI, or other simpl or compound semiconductors.

3. (PREVIOUSLY PRESENTED) The method of Claim 1, wherein:
the matrix of imaging sensors comprise CMOS, CCD, or CID semiconductor sensors.

4. (CANCELLED)

5. (ORIGINAL) The method of Claim 1, wherein:
the overcoat layer is comprised of a negative type photoresist having refractive index adjusted to match the refractive index of the microlens material, nominally at n = 1.5.

6. (PREVIOUSLY PRESENTED) The method of Claim 1, wherein:
the overcoat layer is comprised of a patterned multilayer stack such that one or more color (interference) filters are thereby integrated with the overcoat material.

7. (PREVIOUSLY PRESENTED) The method of Claim 1, wherein:
a layer of microlens material is patterned to form a second matrix of microlenses over the first matrix of microlenses and beneath the overcoat layer, said second matrix of microlenses having a high transmittance undercoat, said second matrix of microlenses being registered with the first matrix of microlenses whereby a compound microlens structure and undercoat/overcoat lay rs are formed to satisfy optical specification and performance.

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8. (PREVIOUSLY PRESENTED) The method of Claim 1, wherein:
the elements of the first matrix of microlenses may be selected from the group consisting of simple hemispherical convex, plano-convex, hemicylindrical, aspheric, holographic, Fresnel, conic sections, or combinations of known lens classes.

9. (PREVIOUSLY PRESENTED) The method of Claim 1, wherein:
the microlens layer material is selected from the group of positive or negative conventional photolithographic materials.

10. (PREVIOUSLY PRESENTED) The method of Claim 1, wherein:
the overcoat layer is exposed to calibrated dosages of ultraviolet or other irradiation to photopolymerize the high transmittance overcoat material whereby the index of refraction, polarizing properties, spectral absorption characteristics are tailored and the overcoat material molecules are cross-linked to provide thickness control .

11. (ORIGINAL) The method of Claim 9, wherein:
the overcoat layer is comprised of a negative type photoresist to serve as a thermal barrier and protective encapsulant for a microlens layer material comprising a positive type photoresist.

12. (CURRENTLY AMENDED) The method of Claim 1 wherein:
~~The~~ the overcoat is exposed to a masked pattern of ultraviolet or other irradiation

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to form a matrix areas within the overcoat with adjusted properties, said masked pattern being registered with on or more subsets of th matrix of the imaging sensors, whereby imaging sensor subset gain-balance and attenuation is provided.

13. (CURRENTLY AMENDED) The method of Claim 1, wherein:

~~The~~ the microlens focal length and depth of focus is adjusted by controlling the ~~high~~ thickness and refractive index in the final fabrication step of the color imager.

14. (CURRENTLY AMENDED) The method of Claim 1, wherein:

the first matrix of microlenses is exposed to ultraviolet or other irradiation, including thermal processes, to further polymerize the microlens layer material to increase the refractive index at a fixed radius of curvature, to tune the focal length of the microlens-overcoat optical structure.

15. (ORIGINAL) The method of Claim 1, wherein:

the overcoat is comprised of a material satisfying at least

the following three requirements:

(1) of index of refraction matched to that of the index of refraction of the microlenses, e.g., n = 1.5,

(2) thermal resistance >270 degrees Centigrade, 85

(3) transmittance >95%.

16. (WITHDRAWN)

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17. (WITHDRAWN)

18. (CURRENTLY AMENDED) The method of Claim 1 wherein:

a ~~planarized~~ second matrix of light shields together with a second passivation layer is formed upon the ~~first planarization~~ first passivation layer and below the first ~~patterned color filter layer~~ optically transparent planarization layer, said second matrix of light shields being registered with the first matrix of light shields.

19. (CURRENTLY AMENDED) The method of Claim 18 wherein:

a ~~planarized~~ third matrix of light shields together with a third passivation layer is formed on the second ~~planarized~~ matrix of light shields and below the ~~first patterned color filter layer~~ first optically transparent planarization layer, said third matrix of light shields being registered with the ~~first~~ second matrix of light shields.

20. (CURRENTLY AMENDED) The method of Claim 1 wherein

~~a second patterend color filter layer is formed with the second planarizing layer,~~ said patterned color filter layer, ~~being~~ is registered with the photosensitive areas of a second subset of the matrix of imaging sensors;

21. (CURRENTLY AMENDED) The method of Claim 1 wherein

~~a third patterned color filter layer is formed with the third planarizing layer~~ , said third patterned color filter layer ~~being~~ is registered with the photosensitive areas of a third subset of the matrix of imaging sensors;

22. (PREVIOUSLY PRESENTED) The method of Claim 1, wherein:

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the first matrix of microlenses is exposed to an ultraviolet or other irradiation pattern to further polymeriz a subset of the first microl ns matrix to increase the refractive index at a fixed radius of curvature, to optically tune a subset of the optical structure.

23. (PREVIOUSLY PRESENTED) The method of Claim 7, wherein: the elements of the first and second matrix of microlenses may be selected from the group consisting of compound hemispherical convex, plano-convex, hemicylindrical, aspheric, holographic, Fresnel, conic sections, or combinations of known lens classes.